It may mean some self-sacrifice, but self-sacrifice just now is the duty of all. There must not be recourse to expensive foods, the quantity of animal food must be reduced and replaced by vegetables, especially those rich in nutriment. Above all, there must be no waste, no throwing away, for example, of bones and dripping.

The little pamphlet is full of useful hints, based on accurate scientific knowledge and trustworthy statistics. The nation roughly spends 600,000,000*l.* per annum on its food. The authors estimate that it is not possible to save more than a tenth of this if due regard is to be paid to health and to the necessity of feeding children well at any cost. Sixty million pounds saved a year looks a large sum, but in these days, when millions are treated almost like sovereigns used to be, it will not be a very large fraction of the total necessary saving if the war is to be carried out to a successful end. Statisticians tell us that the ordinary savings of the nation in peace time amount to 400,000,000*l.* This will have to be increased to 1,600,000,000*l.*; and sixty millions is only one-twentieth of the additional 1,200,000,000*l.* which must go in the shape of taxes and loans to war purposes. The other nineteen-twentieths of this colossal sum must come from savings in other directions, or else the saving in food must be greater; we can only hope that Profs. Wood and Hopkins have placed their estimate too low.

SIR JOHN RHYS.

THE wonderful romance of the life of Sir John Rhys and the great work which he did for Celtic learning have formed the theme of many a writer during the past week. In the pages of NATURE it is appropriate to speak of the man as he appeared to his scientific friends. The dominant qualities of his mind, as they were again and again revealed in intimate personal contact, were a never-failing freshness and elasticity together with the keen insight which seized at once upon the larger problems. "Well, what has been going on in science lately?" was his invariable question when we met after an interval; and his deep interest was always there, whether the subject was radio-activity, or some new light upon heredity and evolution, or Arrhenius's hypothesis of life-bearing germs, persisting from the eternal past, permeating all space, and driven by the pressure of light to all the worlds. And it was just the same in the province where he was master. John Rhys was always looking for the big, far-reaching conclusions. Place-names in the Iberian peninsula were the data for inferring a former southward extension of the Basques; while their northern migration was tentatively suggested by the names of chiefs among the Picts, that mysterious people of which scarcely anything is certainly known. The present writer has heard him tell of the Irish chieftain of whom it is recorded in time-worn stone that he was "the summoner of the fairies"—evidence for a fascinating interpretation of an ancient folk-lore. The fairies, being an older race, living in caves and clinging to the hills, would still be called on by their conquerors, to assist, for example, in repelling some new invader. Such were the delightful subjects of which he talked with scientific friends, and those who would wish to trace, in brief compass, the working of his master mind, cannot do better than read and re-read his presidential address to Section H of the British Association at Bradford (1900), in which he "endeavoured to substitute for the rabble of divinities and demons, of fairies and phantoms that disport themselves at large in Celtic legend, a possible succession of peoples, to each of which should be ascribed its own proper attributes."

With regard to his methods, one little incident may be recorded. About five years ago Lady Rhys told the present writer of a recent journey in Spain, and how the Principal, although with no conversational experience of the language, went up to a man, and, without any hesitation, began to ply him with questions, reading them out of a Spanish conversation book. In this way, taking opportunities as they occurred, he made remarkably rapid progress.

As head of a college it was always his anxiety to promote friendliness and sympathy, and he must, I think, have been satisfied that his efforts were attended with success. The kindness of his heart was well known to those of his many friends who were in trouble, and they at least could dimly imagine the blank left by the death, in 1911, of the comrade who had trodden with him the noble journey of his life.

It is hoped that these few sentences will enable the reader to realise in part the important place held by this great man in the brotherhood of learning, and will reveal something of the affection and admiration felt for him by his friends, and especially by the society to which he brought such high distinction.

E. B. P.

NOTES.

THE action of the Government in assigning a sum of about 30,000*l.* for the development of scientific and industrial research seems likely to have an important influence in British possessions overseas. The Commonwealth of Australia is apparently prepared to expend whatever sum is necessary to establish and administer an institution for such research, even if the cost amounts to half a million. The *Morning Post* of December 24 makes this announcement, but no details are given; and it is not clear whether the Premier of the Commonwealth expressed the intention of his Government to put aside the amount named for an institution of scientific research in relation to industry, or only gave a general assurance that such an outlay would be forthcoming when believed to be necessary. We shall look with close attention for the announcement that the substantial sum mentioned in the report has actually been granted for the establishment of a national laboratory in Australia.

THE funeral of Sir John Rhys, principal of Jesus College and professor of Celtic in the University of Oxford, was attended by a large and representative gathering of Welshmen, members of the University, and others. We learn from the *Times* that among the representatives of learned institutions and other public bodies present were Dr. Bradley (the British Academy), Principal Griffiths (the University of Wales and University College, Cardiff), Mr. D. Lleufer Thomas (Junior Deputy Chancellor, University of Wales), Sir Vincent Evans, chairman, and Mr. Edward Owen, secretary (Royal Commission on Ancient Welsh Monuments), Mr. W. Edwards and Mr. J. M. Edwards (Central Welsh Educational Board), Principal Roberts (University College, Aberystwyth), Prof. Morris Jones (University College, Bangor), and Prof. E. Tyrrel Green (St. David's College, Lampeter). The University of Oxford was represented by the Vice-Chancellor (the Dean of Christ Church), Sir Herbert Warren, many heads of houses, professors, and other members.

A MEMORIAL service for the late Sir Henry Roscoe was held on December 22 at the Rosslyn Hill Unitarian Chapel, at which the Royal Society was represented by the president—Sir J. J. Thomson—Prof. Arthur Schuster, Sir Edward Thorpe, and Prof. Smithells; University College (University of London) by the Vice-Chancellor, Sir Alfred P. Gould, Sir Thomas Barlow, Prof. M. J. M. Hill (chairman of the Academic Council), and Dr. Gregory Foster (the Provost); the Victoria University of Manchester by the Vice-Chancellor, Sir Henry Miers, and Prof. H. B. Dixon; the Chemical Society by Dr. Smiles and Prof. J. C. Philip (secretaries), and Lieut.-Col. A. W. Crossley (foreign secretary); the Society of Chemical Industry by Sir Boverton Redwood and Mr. Watson Smith, a former demonstrator in the Owens College, and late editor of the Journal of the Society of Chemical Industry; the National Physical Laboratory by Dr. Glazebrook and Dr. Harker; the Lister Institute by Dr. Harden; the Royal Commissioners for the Exhibition of 1851, Mr. Evelyn Shaw. Among others present were:—Lord and Lady Courtney, Lord Ashton of Hyde, Viscount Iveagh, the Master of Peterhouse, Sir A. W. Ward and Miss Ward, Sir Joseph Larmor, Dr. Emerson Reynolds, Sir William Tilden, Prof. Millar Thomson, Mr. Frank Scudder (late scientific assistant to Sir Henry Roscoe), Dr. Horace T. Brown and Miss Brown, Dr. Beilby, Dr. C. A. Keane, Dr. H. G. Colman, Dr. F. G. Ogilvie (director of the Science Museum, South Kensington), Mr. Gilbert Redgrave (secretary, Royal Commission on Technical Instruction), Dr. Aubrey Strahan (director of the Geological Survey of Great Britain), and Mr. J. S. Parkin, of the Castner-Kellner Alkali Co. The interment took place on December 23 at the Brookwood Cemetery, in presence of the immediate relatives, a few intimate friends, and representatives of scientific bodies. Among those who attended were Sir Edward Thorpe, Prof. Schuster, Prof. Perkin, Prof. Smithells, Dr. Harden, Dr. Keane, Dr. Colman, Mr. Chas. Cresswell, Mr. Reid, and Mr. Evelyn Shaw.

THE Local Government Board has issued an Order entitled "The Public Health (Measles and German Measles) Regulations, 1915," applying throughout England and Wales a system of notification of these two diseases, and enabling local authorities to undertake measures for the care of patients suffering from them. The Order, which comes into force on January 1, 1916, provides for notification of cases of measles and German measles to the medical officer of health of the district by medical practitioners, or by parents or guardians, or any other person in charge of the patient; these maladies are thus brought into line with several other diseases which have long been notifiable. Notification has been introduced mainly with a view to the control of the spread of infectious diseases, but has hitherto not been generally applied to measles, because the disease is infectious at an early stage, and before it can be definitely recognised. The powers provided by the present Order may tend to limit the spread of the disease, but they will probably be found much more useful in reducing mortality from it. On an average about 11,000 deaths from measles occur in a year in England and Wales, and these are confined chiefly to children under five years of age. Measles itself is not a fatal malady, death being due to complications—principally bronchitis, pneumonia, diarrhœa, and convulsions—which are largely brought about by undue exposure and inefficient nursing during the illness. As a result of notification the medical officer of health can adopt measures to reduce the proportion of fatal cases by rendering advice and providing nursing assistance to the poorest families.

WE regret to announce the death, in his ninety-second year, of Dr. H. Debus, F.R.S., formerly professor of chemistry at the Royal Naval College, Greenwich, and lecturer on chemistry at Guy's Hospital.

THE death is announced of Mr. W. Rupert Jones, who was for forty years assistant librarian of the Geological Society of London, and for a long period prepared the society's valuable annual record of geological literature. He was born in 1855, the eldest son of the late Prof. T. Rupert Jones, and retired in 1913.

SIR H. EVELYN OAKELEY, whose death is announced at eighty-two years of age, was the author of a treatise on algebra and geometry, a collection of mathematical problems, and many reports on educational subjects. At Cambridge he graduated as tenth Wrangler in the Mathematical Tripos of 1859, and was elected to a fellowship at Jesus College in the Midsummer term, 1860. From that date he continued in residence as fellow and mathematical lecturer until he vacated his fellowship by marriage in September, 1862. He was appointed H.M. Inspector of Schools in 1864, and Chief Inspector of Training Colleges in 1885.

THE *Glasgow Herald* of December 21 reports that a strong earthquake was felt on December 19, at 8.5 a.m., at Arrochar and Tarbet, the former being at the head of Loch Long and the latter at the head of Loch Lomond. The shock, which was of intensity 5 (Rossi-Forel scale) at Arrochar, is regarded as the strongest of those felt during the present century in this district. The first, which occurred on September 18, 1904, also attained an intensity of degree 5. The disturbed area contained 564 square miles, its centre being nine miles west of Dunoon. A slighter shock (intensity 4) occurred on July 3, 1908. It was felt over an area of about 400 square miles, with its centre eleven miles north of Dunoon. The epicentre was thus displaced about fourteen miles in a north-easterly direction. From the evidence at present available, a similar further displacement appears to have occurred in the epicentre of the recent shock.

THE accounts of the local committee of the Manchester meeting of the British Association, held in September, lately issued, show that the resolution to observe the strictest economy in view of the exceptional circumstances in which the meeting was held was faithfully kept, and the local officers are to be heartily congratulated on the success of their efforts in this as in other directions. The expenditure amounted to only 862*l.* 15*s.*, and 22 per cent. was all that it was necessary to ask from the guarantors. On the occasion of the previous meeting, in 1887, the expenses reached 3652*l.*, and 35 per cent. of the much larger guarantee fund was called up. The meeting was in every way a success; it was attended by many eminent scientific men, the papers and discussions were of high value, and the arrangements gave such satisfaction that at the concluding meeting of the general committee many influential members expressed the hope that future meetings might be "run" on the same lines, excluding much of the lavish and costly expenditure on entertainments and excursions which has often proved a heavy charge on the local funds.

IN the House of Commons on December 20, Sir Philip Magnus asked the Minister of Munitions whether his attention has been directed to a recent resolution of the British Science Guild urging upon his Majesty's Government the necessity of immediate steps being taken to establish a national school of technical optics, with a view of affording opportunities for the scientific training in this country of artisans and other students in the theory and practice of the several operations needed for the manufacture of the optical instruments and appliances which have hitherto been largely imported from Germany, and are now being imported into this country from the United States of America and elsewhere; and, if so, whether he proposes to take any action in the matter. The question was answered by Dr. Addison as follows:—I understand that the resolution in question was passed by the British Science Guild in July, 1914. The object in view appears to be undoubtedly of the greatest importance, and my right hon. friend has had before him for some months the necessity for increasing the number of skilled workmen available for the manufacture of optical instruments for war purposes. I am advised that a considerable number are being trained at various works engaged on Government contracts. As regards the permanent supply of such workmen, I understand that the matter is receiving the careful attention of the Board of Education. Sir Philip also asked the Minister of Munitions whether he is aware that a small but efficient school of technical optics has been for some time in existence in connection with the Northampton Polytechnic Institute, Clerkenwell; that the governors of that school have purchased at a cost of 13,000*l.* a site for its extension, but have no funds available from which they can complete the necessary extension and equipment, and that unless funds are forthcoming they will be compelled to sell the site to avoid further payment of interest; and whether, in these circumstances, and having regard to the need of a well-equipped school, the Minister of Munitions can see his way to make a grant of money towards the further extension of the school. The answer given by Dr. Addison was:—I am sorry to hear of the difficulties with which the governors of the institute are faced, but the matter does not directly concern the Ministry of Munitions, and I regret that I cannot hold out any prospect of a grant from funds at the disposal of the Ministry. I understand, however, that the matter is under the consideration of the Board of Education and the London County Council.

AT the sixth annual general meeting of the Society of Engineers (Incorporated), held on December 13, the awards of premiums made in respect of papers published in the Journal of the society during 1915 were announced as follows:—The president's gold medal to Mr. A. H. Barker, for his paper entitled "Some Future Developments in Heating and Ventilation"; the Bessemer premium, value 5*l.* 5*s.*, to Mr. Alphonse Steiger, for his paper on "The Modern Development of Water Power"; a society's premium, value 3*l.* 3*s.*, to Mr. S. G. Turner, for his paper entitled "Law and Engineering; Some Points of Contact"; a society's premium, value 2*l.* 2*s.*, to Mr. F. Grove, for his paper on "Main Roads, Past and Present." The following were elected as members of the council and officers for 1916:—*President*, P. Griffith; *Vice-Presidents*, H. C. Adams, W. B. Esson, and W. Noble Twelvetrees; *Members of Council*, H. Adams, C. T. Walrond, F. L. Ball, B. Geen, the Rt. Hon. Lord Headley, F. H. Hummel, T. J. Gueritte, B. H. M. Hewett, G. A. Becks, and G. O. Case; *Associate Member of Council*, C. E. May; *Hon. Secretary and Hon. Treasurer*, D. B. Butler.

STUDENTS of eugenics will be greatly interested by Dr. C. B. Davenport's recent paper on the inheritance of violent temper (*Journ. Nervous and Mental Disease*, xlii., 1915, pp. 593–628). His results are taken from the study of 165 family histories of wayward girls in State institutions. From the facts, clearly set forth in the text and the pedigrees of eleven families in graphic form, the conclusion is drawn that "the tendency to outbursts of temper . . . whether associated with epilepsy, hysteria, or mania or not, is inherited as a dominant trait, typically does not skip a generation, and tends ordinarily to reappear, on the average, in half of the children of an affected parent." Hence it follows that "unaffected members of a fraternity who select an emotionally-controlled consort will only exceptionally, if ever, have affected offspring." This is comforting from the eugenic point of view, and some measures for isolating the worst of the "affected" might at least be discussed.

THE Irish Fisheries Office has lately published two interesting reports (Fisheries, Ireland, Sci. Invest., 1914, iii., iv. [1915]). The first of these, by Miss J. Stephens, deals with sponges from various localities around the Irish coasts, the Triaxonida (*Hexactinellida auct.*), the Tetractonellida, and the Astromonaxonellida. Forty-four species are enumerated, of which six are new to science, and twenty-six are recorded from the Irish marine area for the first time. Of special interest are a Biscayan and Azorean species of Hyalonema, *H. infundibulum* and *Leucopsacus scoliodocus*, hitherto known only from the Japanese Sea and Cape Verde. The other paper describes the results of a biological survey of Blacksod Bay, Co. Mayo, as compiled by Lieut. G. P. Farran, from identifications furnished by many workers at special groups. There are valuable faunistic and ecological observations, among which the influence of the neighbouring whaling station on the littoral fauna and flora is noteworthy. The equipment of the Blacksod station is so good that the detrimental effect of its refuse is confined to an area extending for at most 200 yards on either side of the quay.

THE Carnegie Institution of Washington has lately issued part i. of the third volume of Howard, Dyar, and Knab's great work on the mosquitoes of North and Central America and the West Indies. This comprises the first instalment of the systematic description of genera and species. The illustrative plates form vol. ii. of the work, which has presumably not yet been published, as we are unable to trace its receipt. According to the system adopted by the authors, all "mosquitoes" fall into a single subfamily—the Culicinæ—which, with the Corethrinæ and the Dixinæ, form the family Culicidæ. The Culicinæ are divided into two tribes: the Sabethini, comprising eight genera, and the Culicini, a very large and comprehensive group, subdivided into Deinoceritines, Culicines, Megarhinines, and Anophelines; the two last-named are not included in the part now before us. The work of Dyar and Knab on the structure of mosquito larvæ and its importance in classification is naturally prominent in this volume, and British entomologists will notice that many of the genera established by Theobald on characters drawn from the scaling are set aside. The systematic student will be greatly helped by the diagnostic tables provided, and he will find in all cases a very full synonymy. The introductory historical sketch of the classification of mosquitoes and the frequent accounts of the habits of the insects and their larvæ will ensure a welcome to the book from naturalists who are not specialists among these insects, especially in view of their great importance with regard to tropical diseases.

"VARIABILITY and Amphimixis" is the title of a recent paper by Prof. L. B. Walton (*Amer. Nat.*, xlix., 1915, pp. 649–87), in which he describes the result of observations on the varying sizes of zygospores in Spirogyra formed from "lateral" conjugation (fusion of two adjacent cells of the same filament), as compared with those formed from "scalariform" conjugation (fusion of two cells in distinct filaments). The zygospores resulting from the former process are relatively 26 per cent. more variable in length, and 31 per cent. more variable in diameter, than those resulting from the latter. Prof. Walton regards the scalariform conjugation as an example of sexual reproduction, and the lateral as a "quasi-parthenogenesis"; hence he argues, in opposition to Weismann, Jennings, and others, that "amphimixis . . . decreases and does not augment variability (cumulability), although amphimutability may temporarily be increased." The unfamiliar terms in this quotation are from the author's classification of variations, in which "amphimutations" are defined as "arising through the transference of factors by the combination of two ancestral lines in accordance with Mendelian principles, but exhibiting *per se* no definite progress"; while "cumulations" arise "through causes at present unknown, but which, from the progressive results obtained, may be assumed to originate in accordance with definite laws." On the other hand, Prof. Walton names four subdivisions of "abnormations" "apparently not originating in accordance with definite laws." The classification might be more valuable if the author would tell us exactly what he means by the phrase, "in accordance with definite laws."

THE value of the wood of *Cotoneaster frigida* for making the heads of golf clubs forms the subject of a letter from Sir Herbert Maxwell printed in *Kew Bulletin*, No. 9, p. 414. The wood has been tested for the purpose and found suitable, and may in time replace persimmon, which has succeeded crab and beech. *Cotoneaster frigida* grows easily in this country and seeds freely, but it takes some forty years to produce timber of suitable size. It is also probable that the wood of *Cotoneaster bacillaris* may be found suitable for making club heads; it also grows freely in this country.

IN *Kew Bulletin*, No. 9, Mr. J. H. Lace describes a number of new species from Burma, chiefly from the neighbourhood of Maymyo, and mostly of his own collecting. A large number of new species, including several new trees, have been discovered in this region in recent years owing to the activity of forest officers, and our knowledge of the flora of this region is far from complete. A new tree, *Allospondias laxiflora* (Anacardiaceæ), is among the more interesting of the plants described, as this tree, which is a conspicuous one on the dry limestone hills which rise suddenly out of the plains on both banks of the lower Salween, has been imperfectly known since 1862, when it was described by Kurz as a Buchanania. The original specimen was collected by Brandis, and apparently consisted of flowers only, and it is not known to what plant the leaves described by Kurz may have belonged.

COTTONSEED meal, the ground cake left after the oil is pressed from the seed of cotton, is now used extensively as a cattle food; but whilst it may be fed profitably to horses, cattle, and sheep in moderate amounts, poisoning, and often death, may occur as a result, especially if the animal has not been gradually accustomed to it. It is generally avoided in the case of pigs on account of the numerous deaths associated with its use. The toxic properties of the meal are attributed by Messrs. W. A. Withers and F. E.

Carruth (*Journ. Agric. Research,* vol. v., p. 261) to the substance *gossypol,* which was first isolated by Marchlewski in 1899, from the cottonseed, and patented as a prospective dyestuff. This substance is now shown to have a strong toxic effect upon all the animals experimented with. It occurs in the so-called "glanddots," or "resin-glands," of the seed, and also in the cambium layer of the bark of the root. The problem that now awaits solution is to devise a means of rendering this substance non-toxic. Whilst gossypol can be readily oxidised to a non-toxic form, and can also be rendered harmless by iron salts, the seed tissue surrounding the cells prevents the free action of reagents, so that difficulty is presented in practice in rendering the cake innocuous by a simple treatment. This, no doubt, will be devised before long.

LAST April the American Philosophical Society held an interesting "symposium," resembling the joint discussions of the British Association, on the condition of the earth's interior. The three addresses given are now published in the recently issued bulletin of the society (vol. liv., 1915, pp. 279–308). Prof. T. C. Chamberlin studies the subject from a geological point of view, Prof. H. Fielding Reid describes the results and bearing of seismological investigations, and Dr. J. F. Hayford considers the earth from the geophysical point of view. The writers agree that the conclusions towards which we are tending are not yet firmly established. The methods of research were devised too recently to admit of dogmatism. But it is contended that the varied evidence afforded by geological, seismic, and tidal studies converges in favour, not only of a solid, but of an elastico-rigid, earth, in which liquid and viscous lacunæ, if any such really exist, must be confined to very moderate dimensions. Dr. Hayford's address is specially valuable owing to the many suggestions which he offers for further investigation.

AN important series of earthquakes began on June 22 in the Imperial Valley in the extreme south-east corner of California. They are described by Mr. Carl H. Beal in a valuable paper in the Bulletin of the Seismological Society of America (vol v., 1915, pp. 130–149). A slight fore-shock at about 7.40 p.m. on the day mentioned was followed by two severe earthquakes of intensity 9 (Rossi-Forel scale) at about 8 and 9 p.m. These earthquakes originated in nearly the same region, the buildings damaged by the first shock being completely destroyed by the second. Six persons were killed by falling walls, and the relatively small loss of life is attributed to the brief duration of the shocks and the warning given by the earlier of the strong shocks. Mr. Beal, who traversed the district by motor-car and collected information by means of the telephone, has drawn approximately a series of seven isoseismal lines of intensities 9 to 3. The first is an elongated ellipse about 10 miles in length; the last is circular in form, and includes about 50,000 square miles. The district is traversed by at least three major faults, trending in a south-easterly direction. The fault with which the earthquakes were connected is the San Jacinto fault. This is apparently a branch of the San Andreas rift, the great movement along which gave rise to the Californian earthquake of 1906. In the Imperial Valley, the course of the fault is hidden by recent deposits, which also obscure any permanent deformation that may have taken place at the surface. There is, however, some evidence for thinking that the San Jacinto fault traverses the epicentral district along the axes of the isoseismal lines.

THE Royal Geographical Society in its lectures and its journal keeps abreast of the times. From time to time instructive articles dealing with the areas of the war appear in the *Geographical Journal.* An exhaustive paper by Mr. Douglas Freshfield, on the southern frontier of Austria, appears in the December number (vol. xlvii., part 6). Mr. Freshfield discusses in detail the fighting which has taken place, and concludes that the Italian operations have intentionally been limited to defence in order to secure positions essential for repelling possible attacks on Lombardy or Venetia from the Trentine highlands. A number of maps show the present and proposed frontiers in relation to relief and nationality, and show clearly the justification of the Italian claims in the southern half of the Trentino and north of Trieste. The paper concludes with some account of the little-known frontier lands of Herzegovina and Montenegro.

IN his "Social Anatomy of an Agricultural Community" Mr. C. I. Galpin (Agricultural Experiment Station of the University of Wisconsin Research Bulletin 34, May, 1915) has made attempts in a new and important line of research in social geography. It is a study of the relation of farmer and townsman in the Walworth County of Wisconsin. This survey results in the delimitation of a number of agricultural communities, each with its village or city centre. The area of this nature, linked with the urban centre, may be designated as the country of that town or by the term greater prefixed to the town name, thus emphasising the close relationships of the two. Local government will be last, the author expects, to recognise these communities, and administrative areas give false boundaries. The interrelationships between the town and its country area disclose a mesh of correlated social interests uniting the city dweller and the farmer The rural problem thus becomes part of what Mr. Galpin designates the "rurban" problem. Neither rural or urban problem can be adequately discussed apart from one another. Various aspects of the problem are indicated, and the paper is full of suggestive ideas.

THE Monthly Meteorological Charts of the Indian Ocean issued by the Meteorological Office contain in each issue an ice-chart of the southern hemisphere for the ensuing three months, based on the records of the last eleven or twelve years. The ice-chart of the January, 1916, issue is fuller than usual, and gives the distribution of pack in the Antarctic Ocean in January, February, and March, in addition to the location of recorded bergs in past years. A long list is also given of the icebergs in the Southern Ocean for these three months from 1885 to 1915. The innovation on the chart is welcome, but it might be more thorough. Neither in the Ross nor Weddell Seas are the data complete. Off Wilkes Land there are no indications of pack, and in the South Atlantic the ice-observations by Dr. Bruce in the *Scotia* are not incorporated. These latter might conceivably be of direct importance to merchant vessels; the others could affect only exploring ships. It is remarkable that while the extreme limits of ice approximate to the parallel of 40° S. in the Atlantic and Indian Oceans, records of icebergs are very few in the forties and fifties in longitudes east of Greenwich. In the Pacific, where the ice limits are further south, icebergs are numerous, as they also are in the waters immediately to the east of Cape Horn. The dimensions of some of the bergs recorded by merchant ships suggest probable exaggerations, but it would be impossible satisfactorily to edit these data, and so they must stand as given.

La Nature for December 4 has an interesting popular article on the methods of testing guns and ammunition, being the second article of a series on "Les Laboratoires de la Guerre." The first subject dealt with is the determination of the muzzle velocity of projectiles, measured by the well-known Boulengé chronograph; then follows a description of the crusher gauge and its use for measuring pressures in the gun The apparatus in use in France for gauging the bore of the guns for possible distortion on firing and measuring the horizontal and vertical displacement after firing are described and illustrated. The stability on firing is a most important question, and is registered by means of suitable points attached to the gun and wheel axles which score directly on plates suitably placed in relation to the movement to be traced. With the latest Schneider guns it is stated that a glass of wine placed on the rim of the wheel is not upset on firing the gun. The velocity of recoil and return is measured by means of the tuning-fork method, the vibrations of the fork and travel of the gun being recorded on a blackened bar fixed to the top of the gun. The temperature attained on firing successive rounds is estimated by the use of a series of fusible crayons of chosen melting point to form a scale of temperatures permitting measurement to 20° C. An interesting feature of the article is the description of the drastic tests to which field pieces are subjected. At the Creusot factory four of the carriages are run by electric power over a circular track of *pavé*; at the Schneider works the carriage is drawn by an engine running alongside the test track over every conceivable object likely to be met with in the field, various road surfaces, ditches, railway lines, etc., and they are also tested under horse traction. In dealing with projectiles the degree of fragmentation is considered, and some illustrations given of the effect of shell fire on a field battery and on a concrete wall.

The Research Laboratory of the Eastman Kodak Company at Rochester, New York, was organised in 1912, and in full working order early in 1913. Since then Dr. C. E. K. Mees and the staff working with him have published the results of their work in various journals in this country and in America, and as it is likely that many who are interested have not these journals available, the company has just issued a seventy-six page pamphlet, which contains abstracts of all the scientific papers published by them during the years 1913 and 1914. This step cannot fail to be appreciated by those who are privileged to receive a copy. There are three chief departments of the laboratory, namely, chemistry, physics, and photography. The pamphlet contains abstracts of twenty-two papers—none chemical. Perhaps the chemical work done is too intimately connected with the factory to justify its publication. The abstracts give the chief results obtained, and hence are useful without reference to the originals. The greater number of the abstracts are intimately connected with photography, and deal with such matters as sensitometry, colour processes, brightness of image, resolving power, etc., and some are of more general interest. L. A. Jones has investigated the utility of the standard acetylene lamp designed by Mees and Sheppard, which consists of an acetylene flame from a single jet and a diaphragm in front that isolates about 5 mm. of it. It is simple, requires but little attention, and is otherwise satisfactory. The "Colour of Illuminants," by L. A. Jones, "The Axial Chromatic Aberration of the Human Eye," by P. G. Nutting, "The Visibility of Radiation," by P. G. Nutting, are other papers which will appeal to many who may care but little about photography.

The second series of Science Reports of the Tôhoku Imperial University, vol. iv., No. 4, contains a fifth communication "On the Chief Constituent of Japan Lac," by Rikô Majima. This is a remarkable compound, of a type that has not hitherto been found in nature, namely, an aromatic compound, with a very long aliphatic side-chain. The compound itself, which is described as urushiol, is unsaturated; but it can be reduced to a saturated compound, hydrourushiol, to which a definite formula can now be assigned, namely, $1:2:3\text{-}C_6H_3(OH)_2(C_{15}H_{31})$. The aromatic nucleus is of the familiar pyrocatechol type; but it contains a normal pentadecyl group attached as a long "straight-chain" to the nucleus in the position immediately adjacent to the two hydroxyl groups. The position of the double-bonds in the side-chain of the unsaturated urushiol is still undetermined.

An account of the construction of some laboratory electric furnaces, given in an article in Nature of December 16, contained a sectional diagram and a description of a single-tube furnace. The purpose of the article was mainly to explain the principles followed in the design of such furnaces; and Messrs. Gallenkamp and Co., Ltd., wish it to be understood that the diagram, which was drawn by the contributor of the article, should not be taken as an actual representation of the details of their patented furnaces. The specification of their laboratory furnaces of various types, with particulars as to performance, advantages, and prices, will be found in a special pamphlet (List No. 65) recently issued by Messrs. Gallenkamp, who will send a copy to science teachers and other workers engaged in instruction or research upon application being made to them at 19/21 Sun Street, Finsbury Square, London, E.C.

A catalogue of books on Africa, just issued by Mr. Francis Edwards, High Street, Marylebone, deserves attention. In its classified lists are many books from the library of Mr. Charles Cowen, editor of the *Cape*

Monitor, and a large number of volumes dealing with the South African war of 1899–1902. The catalogue also includes more than sixty oil paintings by James Baines, who had a wide experience of southern tropical Africa, and was with Livingstone on his Zambezi expedition. The only other known collections of Baines's pictures are in the possession of the Royal Geographical Society and the museum at Kew Gardens. The catalogue is exclusive of Mediterranean Africa and the Red Sea border.

OUR ASTRONOMICAL COLUMN.

SUN-SPOTS AND PRESSURE.—A paper dealing with pressure data has been received from Dr. Gilbert S. Walker, who is engaged on a comprehensive statistical investigation in world meteorology with the object of laying the foundation of a secure system of seasonal weather forecasting. The data are treated as in the case of rainfall and temperature in preceding papers. For pressure the Indian area is characterised by negative correlation coefficients, whilst in the western hemisphere and boreal regions the opposite sign prevails. A general tendency is observable for the pressure coefficients to be opposite in sign to those for rainfall, indicating that their variations are dominated by a common cause, and temperature would seem to have little influence on either. Humidity, especially in the upper air, appears to control the relationship between sun-spots and temperature (Mem. Indian Met. Dept., vol. xxi., part xii., No. vi.).

HARMONIC ANALYSIS OF THE MOTIONS OF THE HELIUM STARS.—The dynamics of our stellar system are engaging an increasing degree of attention, and although Alcyone, and, recently, Canopus have been the suggested super-suns, it is still a question of establishing the existence of the general orbital movement. Prof. von S. Oppenheim adopts the working hypothesis that such movement exists, and some results of his work in this field were recently noted in this column (October 21). In an earlier investigation Prof. Oppenheim employed harmonic analysis to answer cognate questions. This is now recalled because these investigations have lately been carried a stage further (*Astronomische Nachrichten,* 4822). Pursuing the analogy drawn from the swarm of minor planets, he observes that a precise parallelism probably exists if instead of dealing with the totality of the stars the movements of the galaxy-grouping helium stars (type B) are alone taken into account. Employing the methods of the earlier papers to deal with the Lick results for the radial velocities of 233 stars of this type, taking proper motions from the Boss Catalogue, and making an approximation in regard to parallax, he finally obtains as developments of expressions involving respectively proper motions and radial velocities two Fourier series the terms of which are in good agreement regarding an orbital position angle of the sun, a result considered to establish the reality of the original hypothesis (*i.e.* that the stars, including the sun, move in circular orbits about one ideal centre). The numerical results which may be specially mentioned concern the position of this centre. Taking ☊ = 234° 40′ as the ascending node of the plane of the sun's way, with inclination $i = 53^\circ$, then the sun viewed from the centre of the system appears in R.A. 203° 55′, declination −34° 9′. The corresponding apex of the solar motion is R.A. 266°, and declination +34° 37′.

THE ASTRONOMICAL AND ASTROPHYSICAL SOCIETY OF AMERICA.—We have received a copy of the second volume of the publications of this peripatetic society. The meetings reported range from the eleventh, 1910—attended by a number of important English astronomers—to the fifteenth, 1913. Abstracts are given of the papers. A most important feature of the volume is an appendix devoted to Halley's comet. The special committee of the Astronomical Society made suggestions that led to Mr. Ferdinand Ellerman taking an expedition to Honolulu to secure a record of the appearances presented by the comet during the spring of 1910. Two cameras were employed, a 6-in. Brashear, f.l. 31·8 in., and a Bausch and Lomb Tessar lens of 57 mm. aperture, and 251 mm. f.l. The greatest length of tail photographed with the latter was 50° on May 14. The photographs obtained are described by Prof. E. E. Barnard, and no fewer than forty-seven are reproduced. The dates range from April 26–June 6. The Comet Committee also publish a very extensive index catalogue of photographs of the comet, giving date, time of exposure, optical constants, place, and an indication of the technical quality of the photograph.

PROBLEMS OF EFFICIENT METHODS OF DOMESTIC HEATING.

THE determination of the efficiencies of different methods of heating is a problem very difficult to solve on a purely scientific basis. It is, indeed, difficult to attach a precise meaning to the expression "efficiency" in connection with heating apparatus. The word as commonly understood in connection with devices for the utilisation of energy in any form means the ratio of the total amount of energy utilised to that consumed. In a heating apparatus it is difficult to say what fraction of the energy is to be regarded as "utilised." If we regard that heat only as utilised which is delivered into *the air* of a room, in one sense every apparatus which when suitably disposed delivers almost the whole of its heat into the air of a room may be regarded as having nearly the maximum possible efficiency—100 per cent. Such, for example, is the electric low-temperature stove (not taking into account the generating mechanism or boilers from which the heat is ultimately derived), or the oil stove, or the gas radiator, which deliver the products of combustion into the air of the room.

But heat is delivered into a room not only by convection currents of heated air, but also by the conversion of radiant energy into heat. The proportion of the radiant energy which may be converted into heat is essentially uncertain. It depends on the position of the radiant body relatively to the windows, walls, furniture, etc., and on other circumstances. If therefore the "efficiency" of the apparatus depends on such extraneous considerations, it is evidently out of place to use, in connection with this matter, such a word as "efficiency," which has a precisely defined significance. Alternatively we are debarred from regarding the air heat as the only "utilised" energy.

Functionally, a heating apparatus is one by which a certain amount of heat energy is passed through a room to the outer air. As a consequence of its passage, certain thermal and other conditions in the room are maintained. If the resistance interposed between the room and the outer air is relatively high, the same flow of heat will maintain a higher temperature than if the resistance is low. In the limit if the resistance were supposed infinitely great, the thermal conditions might be conceived to be maintained without any expenditure of heat whatever. It